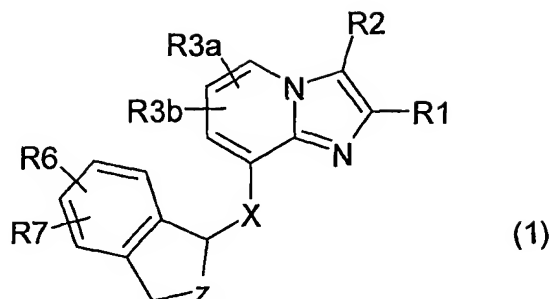


Patent claims

1. A compound of the formula 1



in which

R1 is hydrogen, 1-4C-alkyl, 3-7C-cycloalkyl, 3-7C-cycloalkyl-1-4C-alkyl, 1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkyl, 1-4C-alkoxycarbonyl, 2-4C-alkenyl, 2-4C-alkynyl, fluoro-1-4C-alkyl or hydroxy-1-4C-alkyl,

R2 is hydrogen, 1-4C-alkyl, aryl, 3-7C-cycloalkyl, 3-7C-cycloalkyl-1-4C-alkyl, 1-4C-alkoxycarbonyl, hydroxy-1-4C-alkyl, halogen, 2-4C-alkenyl, 2-4C-alkynyl, fluoro-1-4C-alkyl, 1-4C-alkyl-aminomethyl or cyanomethyl,

R3a is hydrogen, halogen, fluoro-1-4C-alkyl, 1-4C-alkyl, 2-4C-alkenyl, 2-4C-alkynyl, carboxyl, -CO-1-4C-alkoxy, hydroxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkoxy-1-4C-alkyl, fluoro-1-4C-alkoxy-1-4C-alkyl or the group -CO-NR31R32,

R3b is hydrogen, halogen, fluoro-1-4C-alkyl, 1-4C-alkyl, 2-4C-alkenyl, 2-4C-alkynyl, carboxyl, -CO-1-4C-alkoxy, hydroxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkoxy-1-4C-alkyl, fluoro-1-4C-alkoxy-1-4C-alkyl or the group -CO-NR31R32,

where

R31 is hydrogen, hydroxyl, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl and

R32 is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl,

or where

R31 and R32 together, including the nitrogen atom to which both are bonded, are a pyrrolidino, piperidino, piperazino, N-1-4C-alkylpiperazino or morpholino group,

Z has the meaning -CHR4- or -CHR4-CHR5-

where

R4 is hydrogen, 1-7C-alkyl, 2-7C-alkenyl, hydroxyl, 1-4C-alkoxy, oxo-substituted 1-4C-alkoxy, 3-7C-cycloalkoxy, 3-7C-cycloalkyl-1-4C-alkoxy, hydroxy-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkoxy-1-4C-alkoxy, 3-7C-cycloalkoxy-1-4C-alkoxy, 3-7C-cycloalkyl-1-4C-alkoxy-1-4C-alkoxy, 1-4C-alkylcarbonyloxy, halo-1-4C-alkoxy, amino, mono- or di-1-4C-alkylamino, 1-4C-

alkylcarbonylamino, 1-4C-alkoxycarbonylamino, mono- or di-1-4C-alkylamino-1-4C-alkylcarbonyloxy or 1-4C-alkoxy-1-4C-alkoxycarbonylamino,

R5 is hydrogen, 1-7C-alkyl, 2-7C-alkenyl, hydroxyl, 1-4C-alkoxy, oxo-substituted 1-4C-alkoxy, 3-7C-cycloalkoxy, 3-7C-cycloalkyl-1-4C-alkoxy, hydroxy-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkoxy-1-4C-alkoxy, 3-7C-cycloalkoxy-1-4C-alkoxy, 3-7C-cycloalkyl-1-4C-alkoxy-1-4C-alkoxy, 1-4C-alkylcarbonyloxy, halo-1-4C-alkoxy, amino, mono- or di-1-4C-alkylamino, 1-4C-alkylcarbonylamino, 1-4C-alkoxycarbonylamino, mono- or di-1-4C-alkylamino-1-4C-alkylcarbonyloxy or 1-4C-alkoxy-1-4C-alkoxycarbonylamino,

R6 is hydrogen, 1-4C-alkyl, hydroxy-1-4C-alkyl, 1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkyl, 2-4C-alkenyloxy, 1-4C-alkylcarbonyl, carboxyl, 1-4C-alkoxycarbonyl, carboxy-1-4C-alkyl, 1-4C-alkoxycarbonyl-1-4C-alkyl, halogen, hydroxyl, trifluoromethyl, nitro, amino, mono- or di-1-4C-alkylamino, 1-4C-alkylcarbonylamino, 1-4C-alkoxycarbonylamino, 1-4C-alkoxy-1-4C-alkoxycarbonylamino or sulfonyl,

R7 is hydrogen, 1-4C-alkyl, 1-4C-alkoxy, 1-4C-alkoxycarbonyl, halogen, trifluoromethyl or hydroxyl,

X is O (oxygen) or NH, and

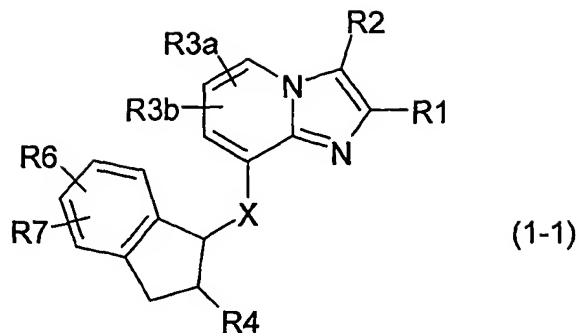
aryl is phenyl or substituted phenyl having one, two or three identical or different substituents from the group consisting of 1-4C-alkyl, 1-4C-alkoxy, carboxyl, 1-4C-alkoxycarbonyl, halogen, trifluoromethyl, nitro, trifluoromethoxy, hydroxyl and cyano,

and its salts, with the provisos that

- (1) R3a is not hydrogen, halogen, 1-4C-alkoxy or -CO-1-4C-alkoxy when R3b is hydrogen, Z has the meaning -CHR4- and R4 is hydrogen or 1-7C-alkyl,
- (2) R3a is not hydrogen, halogen, 1-4C-alkoxy or -CO-1-4C-alkoxy when R3b is hydrogen, Z has the meaning -CHR4-CHR5-, R4 is hydrogen or 1-7C-alkyl and R5 is hydrogen or 1-7C-alkyl,
- (3) R3a is not hydrogen or halogen when R3b is hydrogen, Z has the meaning -CHR4- and R4 is hydroxyl,
- (4) R3a is not hydrogen or halogen when R3b is hydrogen, Z has the meaning -CHR4-CHR5-, one of R4 and R5 is hydroxyl and the other is hydrogen or 1-7C-alkyl,
- (5) R3a is not hydrogen when R3b is hydrogen, X is O (oxygen), Z has the meaning -CHR4- and R4 is 1-4C-alkoxy, 3-7C-cycloalkoxy, 1-4C-alkoxy-1-4C-alkoxy or 1-4C-alkylcarbonyloxy and
- (6) R3a is not hydrogen when R3b is hydrogen, X is O (oxygen), Z has the meaning -CHR4-CHR5-, one of R4 and R5 1-4C-alkoxy, 3-7C-cycloalkoxy, 1-4C-alkoxy-1-4C-alkoxy or 1-4C-alkylcarbonyloxy and the other is hydrogen.

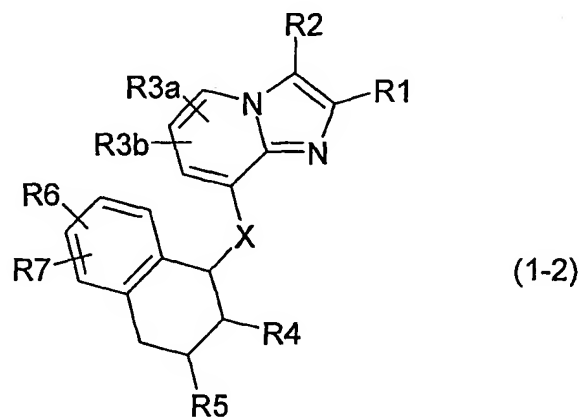
2. A compound of the formula 1 according to claim 1, in which Z has the meaning -CHR4- and which is characterized by the formula 1-1

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in which R1, R2, R3a, R3b, R4, R6, R7 and X have the meanings given in claim 1.

3. A compound of the formula 1 according to claim 1, in which Z has the meaning -CHR₄-CHR₅- and which is characterized by the formula 1-2



in which R1, R2, R3a, R3b, R4, R5, R6, R7 and X have the meanings given in claim 1.

4. A compound of formula 1 according to claim 1,

in which

R1 is 1-4C-alkyl,

R2 is hydrogen, 1-4C-alkyl or halogen,

R3a is in the 6-position and denotes carboxyl, -CO-1-4C-alkoxy, hydroxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkyl or the group -CO-NR₃₁R₃₂,

where

R₃₁ is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl and

R₃₂ is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl,

or where

R₃₁ and R₃₂ together, including the nitrogen atom to which both are bonded, are a pyrrolidino, piperidino, piperazino, N-1-4C-alkylpiperazino or morpholino group,

R3b is hydrogen,

Z has the meaning $-\text{CHR}_4-$ or $-\text{CHR}_4\text{-CHR}_5-$
where

R₄ is hydroxyl,

R₅ is hydrogen,

R₆ is hydrogen, 1-4C-alkyl or 1-4C-alkoxy,

R₇ is hydrogen,

X is O (oxygen) or NH,

and its salts.

5. A compound of formula 1-1 according to claim 2, in which

R₁ is 1-4C-alkyl,

R₂ is hydrogen, 1-4C-alkyl or halogen,

R_{3a} is in the 6-position and denotes carboxyl, $-\text{CO}-1-4\text{C-alkoxy}$, hydroxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkyl or the group $-\text{CO-NR}_{31}\text{R}_{32}$,

where

R₃₁ is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl and

R₃₂ is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl,

or where

R₃₁ and R₃₂ together, including the nitrogen atom to which both are bonded, are a pyrrolidino, piperidino, piperazino, N-1-4C-alkylpiperazino or morpholino group,

R_{3b} is hydrogen,

R₄ is hydroxyl,

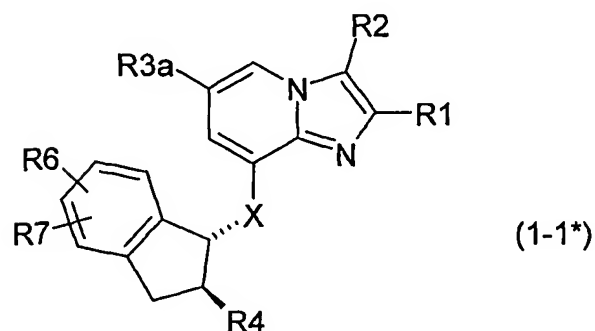
R₆ is hydrogen, 1-4C-alkyl or 1-4C-alkoxy,

R₇ is hydrogen,

X is O (oxygen) or NH,

and its salts.

6. An optically pure compound of formula 1-1 according to claim 2, which is characterized by the formula 1-1*



and in which

R1 is 1-4C-alkyl,

R2 is hydrogen, 1-4C-alkyl or halogen,

R3a is in the 6-position and denotes carboxyl, -CO-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkyl, 1-4C-alkoxy-1-4C-alkoxy-1-4C-alkyl or the group -CO-NR31R32,

where

R31 is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl and

R32 is hydrogen, 1-7C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl,

or where

R31 and R32 together, including the nitrogen atom to which both are bonded, are a pyrrolidino, piperidino, piperazino, N-1-4C-alkylpiperazino or morpholino group,

R4 is hydroxyl, 1-4C-alkoxy, oxo-substituted 1-4C-alkoxy, 3-7C-cycloalkoxy, 3-7C-cycloalkyl-1-4C-alkoxy, hydroxy-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkoxy-1-4C-alkoxy, 3-7C-cycloalkoxy-1-4C-alkoxy, 3-7C-cycloalkyl-1-4C-alkoxy-1-4C-alkoxy, 1-4C-alkylcarbonyloxy, halo-1-4C-alkoxy, amino, mono- or di-1-4C-alkylamino, 1-4C-alkylcarbonylamino, 1-4C-alkoxycarbonylamino, mono- or di-1-4C-alkylamino-1-4C-alkylcarbonyloxy or 1-4C-alkoxy-1-4C-alkoxycarbonylamino,

R6 is hydrogen, 1-4C-alkyl, 1-4C-alkoxy or halogen,

R7 is hydrogen,

X is O (oxygen) or NH,

and its salts.

7. A compound of formula 1-1* according to claim 6, in which

R1 is 1-4C-alkyl,

R2 is 1-4C-alkyl,

R3a is in the 6-position and denotes carboxyl, -CO-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkyl or the group -CO-NR31R32,

where

R31 is hydrogen, 1-4C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl and

R32 is hydrogen or 1-4C-alkyl,

R4 is hydroxyl,

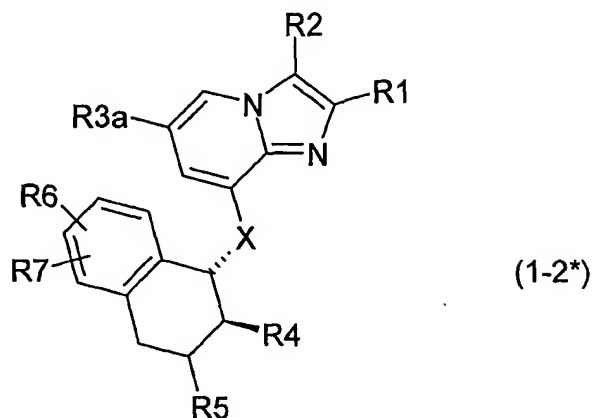
R6 is hydrogen,

R7 is hydrogen,

X is O (oxygen) or NH,

and its salts.

8. An optically pure compound of formula 1-2 according to claim 3, which is characterized by the formula 1-2*



in which

R1 is 1-4C-alkyl,

R2 is 1-4C-alkyl,

R3a is in the 6-position and denotes carboxyl, -CO-1-4C-alkoxy, 1-4C-alkoxy-1-4C-alkyl or the group -CO-NR₃₁R₃₂,

where

R₃₁ is hydrogen, 1-4C-alkyl, hydroxy-1-4C-alkyl or 1-4C-alkoxy-1-4C-alkyl and

R₃₂ is hydrogen or 1-4C-alkyl,

R4 is hydroxyl,

R5 is hydrogen,

R6 is hydrogen,

R7 is hydrogen,

X is O (oxygen) or NH,

and its salts.

9. A medicament comprising a compound as claimed in claim 1 and/or a pharmacologically acceptable salt thereof together with customary pharmaceutical auxiliaries and/or excipients.

10. The use of a compound as claimed in claim 1 and its pharmacologically acceptable salts for the prevention and treatment of gastrointestinal disorders.